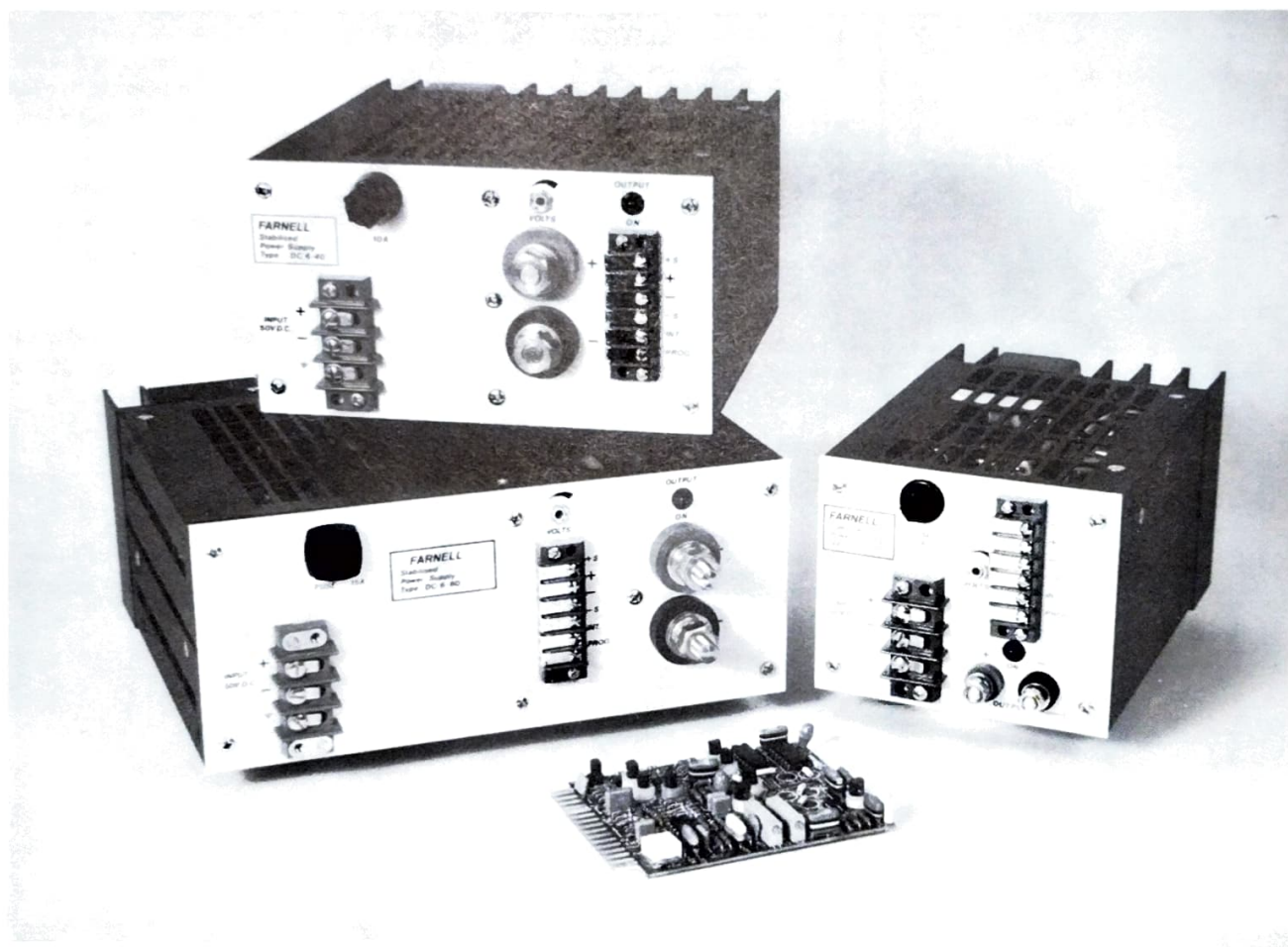




# Farnell

## DC range d.c. — d.c. converters



**Switched-mode technique for compactness and high efficiency**

**Generous d.c. output adjustment range : 4-6V, 8-12.6V or 16-25.2V depending on model. Full current at any setting within that range in ambients up to 55°C**

**All units programmable down to 1V with full current available**

**Soft start circuit holds down in-rush current**

**L.E.D. lamp indicates presence of output**

**Well protected. Constant current limiting. Overvoltage protection. Accessible fuses. Optional overcurrent trip**

**500V input/output insulation. Low r.f.i.**

**Test procedure includes numerous switch-on cycles and elevated temperature test over two weeks for maximum reliability**

**Mechanically compatible with other manufacturer's units. Identical fixing, heat sink position etc.**

The Farnell d.c. range power supplies use a switched-mode technique to provide stabilised d.c. from d.c. inputs. Compared with conventional series regulator units they offer dramatic size and weight reduction and conserve power by operating more efficiently.

The units are in three package sizes of 120, 240 and 360 watts maximum output power. Three versions of each package give 6, 12 or 24 volts nominal at currents appropriate to package VA. Output voltage may be set within the range shown in 'Units available' by a screwdriver adjustment to a potentiometer accessible through a hole in the front panel. Full current is available at any setting within the range of the unit at ambient temperatures of up to 55°C. Alternatively, the output voltage may be programmed by external resistance from nominal to as low as 1 volt without loss of current. Provision is also made for remote sensing of the load to correct for voltage drop in the load connecting leads. Units may be connected directly in series or parallel. An L.E.D. lamp indicates presence of output and where several units are employed in one installation, provides a rapid visual check of the power system.

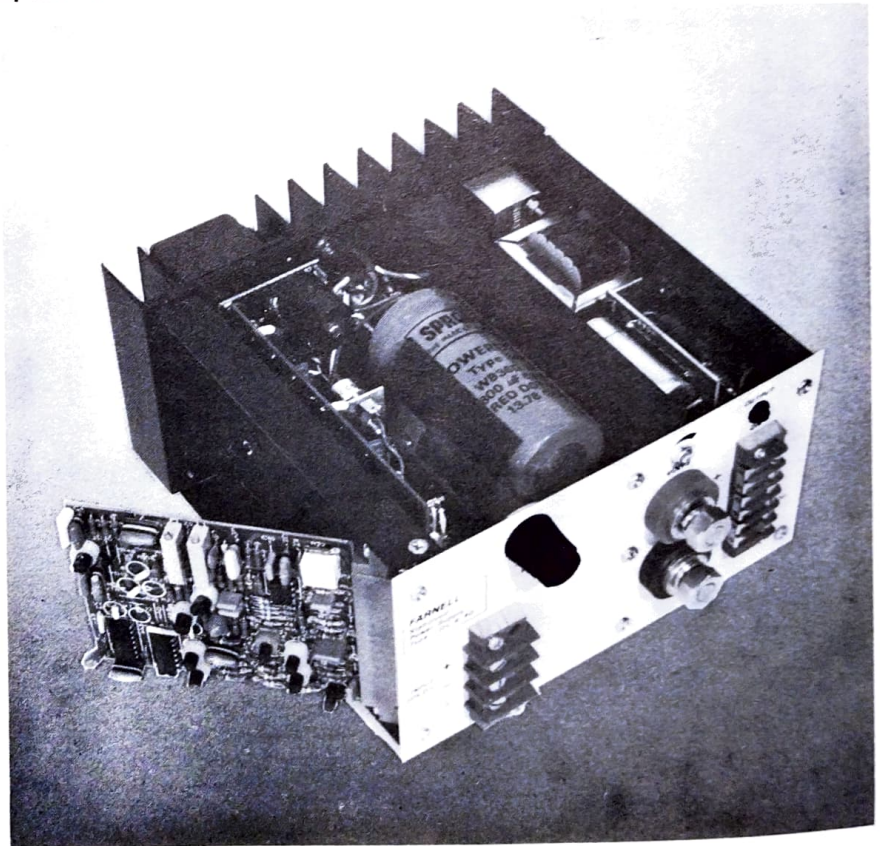
Constant current limiting and overvoltage protection are provided and are factory preset. An overcurrent trip (option C) is available to disable the output after approximately 200ms of overcurrent. This provides greater protection for the external load in the event of short current overload. This provides greater protection for the external load in the event of short circuits on power carrying tracks on P.C. boards for example. The standard current limit circuit resets itself automatically when the load returns to normal. The optional current trip, like the overvoltage protection, is reset by momentarily interrupting the d.c. input to the power unit. A fuse is fitted on the d.c. input and is readily accessible on the front panel.

Switch on (inrush) current has been minimised by the use of a 'soft-start' circuit. This ensures that the peak value of input current at switch-on is limited to the value given in the specification.

Quantities of units with alternative input voltages, output voltages and facilities can be manufactured to special order.

*Triple output units in 240W package are described in a separate publication. These are DCT6-20 providing 4.75-6V, 20A and 2 x 14.5-15.5V, 1.75A and DCT6-20 B providing 4.75-6V, 20A and 2 x 11.5-12.5V, 1.75A.*

#### Open view



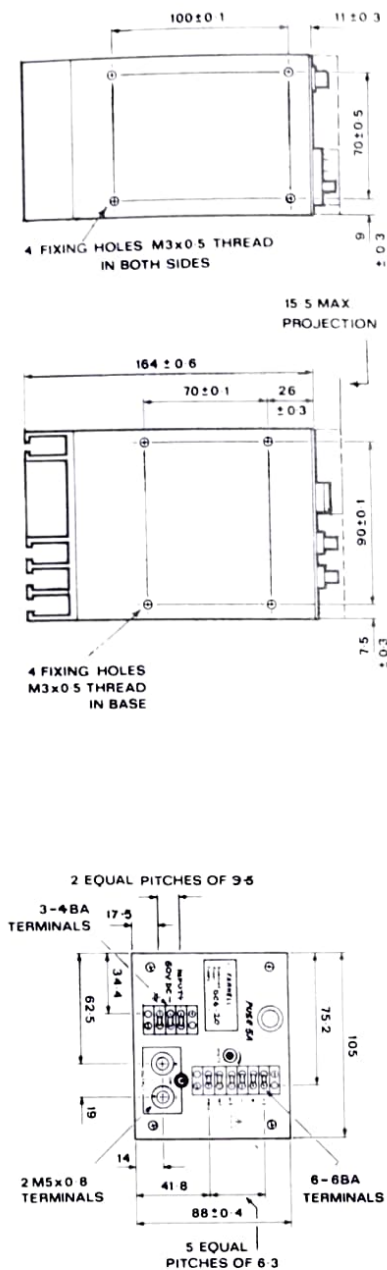
#### Rack mounting

Units fit the aperture of the VERO KM4 Card Frame system (or similar) which conforms to DIN41494 standard for Eurocards small (100 x 160mm) and large (233.4 x 160mm).

Mounting metalwork is normally available from the card manufacturers.

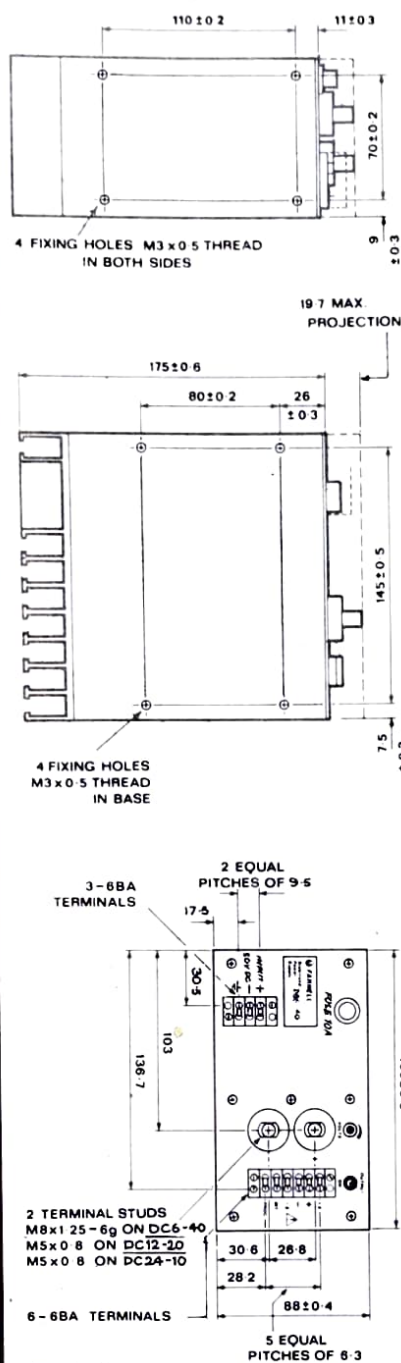


## Mechanical details: 120 watt package



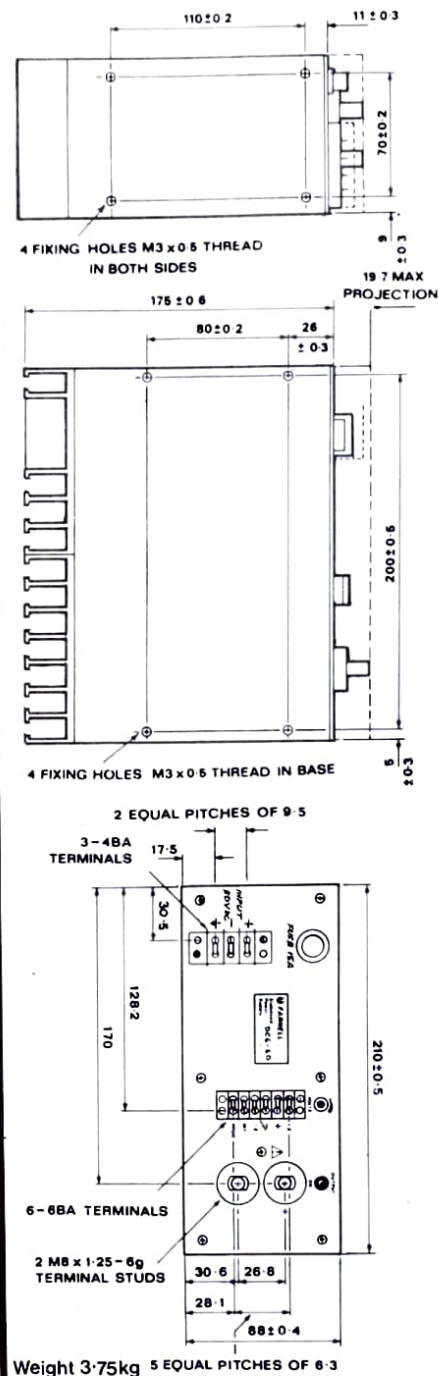
Weight 2kg

## 240 watt package



Weight 3kg

## 360 watt package



Weight 3.75kg

### Units available

Model	Max. output d.c.	Output voltage adjustment range	Package
DC6-20	6V, 20A	4-6V	120W
DC6-40	6V, 40A	4-6V	240W
DC6-60	6V, 60A	4-6V	360W
DC12-10	12.6V, 10A	8-12.6V	120W
DC12-20 *	12.6V, 20A	8-12.6V	240W
DC12-30 *	12.6V, 30A	8-12.6V	360W
DC24-5	25.2V, 5A	16-25.2V	120W
DC24-10	25.2V, 10A	16-25.2V	240W
DC24-15 *	25.2V, 15A	16-25.2V	360W

\* Special Order

## General specification

**Nominal input** 50V d.c.      **Variation tolerated**  $\pm 16\%$       **Output** See 'Units available'

**Output regulation** 0.1% maximum variation for a worst case combination of 0-100% load change and  $-16\%$  to  $+16\%$  nominal line change

**Ripple and noise** at full load (30MHz bandwidth). Less than 10mV r.m.s.; 80mV pk-pk

**Temperature coefficient**  $\pm 0.01\%$  per  $^{\circ}\text{C}$  typical

**Output impedance** 100m  $\Omega$  at 100kHz and  $25^{\circ}\text{C}$  typical

**Transient recovery time** Typically 1mS for output to recover within 50mV following a 10-100% or 100-10% load change of 5 $\mu\text{S}$  risetime. Typical instantaneous output deviation 350mV

**Operating ambient temperature range**  $0^{\circ}\text{C}$  to  $55^{\circ}\text{C}$  for full output current

**Maximum operating ambient temperature**  $70^{\circ}\text{C}$ . Output current derates linearly from full load at  $55^{\circ}\text{C}$  to half load at  $70^{\circ}\text{C}$

**Storage temperature range**  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

**Hold-up time** Output maintained for typically 5mS at maximum output current and 50V nominal input with the unit operating at maximum output voltage

**Switch-on surge** Limited by soft start facility to 3 times full load current

**Switch-on time** Output established within 600mS typically

**Insulation** Tested at 500V peak for one minute between d.c. input and d.c. output, with output terminals and earth connected together.  $\pm 250\text{V}$  d.c. continuous rating between output and earth. Tested to 500V d.c. for one minute

**Remote voltage control** Programming resistance 1000 $\Omega/\text{V}$   $\pm 0.5\%$   
Range: 1V to unit max. output voltage

**External sensing limitation** Unit output terminal voltage must not exceed 6V for nominal 6V units, 12.6V for nominal 12V units and 25.2V for nominal 24V units, i.e. load voltage + total lead voltage < max. range voltage

**Efficiency** Better than 70%. Typically 77% at full load

**Protection** *Overload* Constant current limiting set at  $110\% \pm 5\%$  of full load.  
Option C. As above plus output disabled after approx. 200mS of overload

*Overvoltage* Set at nominal output voltage  $+20\%$ . Disables control circuit and output falls to zero. See options.

*Fuse* The d.c. input circuit is fused

**Series and parallel operation** No limit on parallel operation  
Series operation to a max. total output voltage of 250V

**Remote on/off** Output is reduced to zero by short-circuiting the 'PROG' and '+S' terminals

**Options** Suffix C overcurrent trip. For overvoltage at 6V instead of  $+20\%$  add on suffix D (on 6V units)

Represented by:

Manufactured in England by:



FARNELL INSTRUMENTS LIMITED  
SANDBECK WAY · WETHERBY  
WEST YORKSHIRE LS22 4DH  
TELEPHONE 0937-63541 · TELEX 557294

LONDON OFFICE:  
TELEPHONE 01-864 7433 & 7434

# **INSTRUCTION BOOK FOR**

**DC range  
DC to DC converters**

PRICE £2.00

ISSUE NO.1 3.79

# CONTENTS

Schedule of equipment supplied .....	1
Introduction .....	2
Specification .....	3
Operating instructions .....	4
Mechanical details .....	6
Maintenance .....	7
Notes .....	8

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Figure 1. The effect of the concentration of the *Agaricus bisporus* spores on the growth of *Agaricus bisporus* on the substrate.



# INTRODUCTION

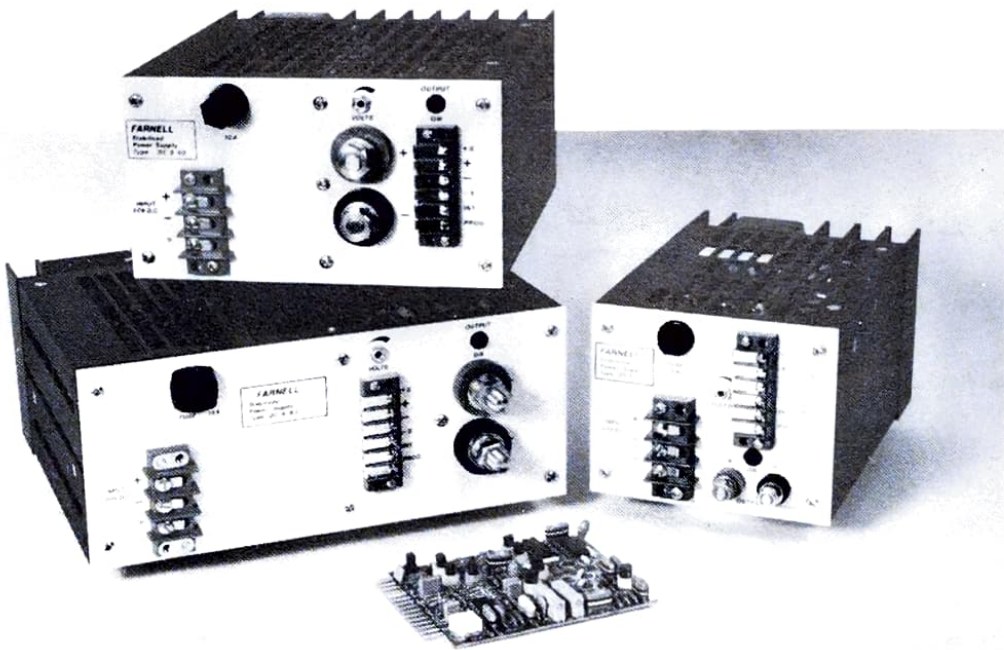
The Farnell DC range converter power units are high efficiency small size d.c. power supplies utilising a switching technique to obtain input/output isolation and output regulation.

The available voltage and current ranges are shown in the specification. Voltage adjustment is provided by means of a trimmer potentiometer accessible through a hole in the front panel or is programmable by an external resistance.

Overcurrent and overvoltage protection are provided and are factory preset. On removal of the fault condition the overcurrent protection resets automatically. To reset the overvoltage trip it is necessary to momentarily disconnect the d.c. input.

The units are protected against reverse input polarity. Incorrect polarity will cause the fuse to blow.

The units will operate at full load in ambient temperatures from 0°C to 55°C.



# SPECIFICATION

Units available

Model	Max. output d.c.	Output voltage adjustment range	Package
DC6-20	6V, 20A	4-6V	120W
DC6-40	6V, 40A	4-6V	240W
DC6-60	6V, 60A	4-6V	360W
DC12-10	12.6V, 10A	8-12.6V	120W
DC12-20 *	12.6V, 20A	8-12.6V	240W
DC12-30 *	12.6V, 30A	8-12.6V	360W
DC24-5	25.2V, 5A	16-25.2V	120W
DC24-10	25.2V, 10A	16-25.2V	240W
DC24-15 *	25.2V, 15A	16-25.2V	360W

\* Special Order

## General specification

**Nominal input** 50V d.c.      **Variation tolerated**  $\pm 16\%$       **Output** See 'Units available'

**Output regulation** 0.1% maximum variation for a worst case combination of 0-100% load change and  $-16\%$  to  $+16\%$  nominal line change

**Ripple and noise** at full load (30MHz bandwidth). Less than 10mV r.m.s.; 80mV pk-pk

**Temperature coefficient**  $\pm 0.01\%$  per  $^{\circ}\text{C}$  typical

**Output impedance** 100m $\Omega$  at 100kHz and 25  $^{\circ}\text{C}$  typical

**Transient recovery time** Typically 1mS for output to recover within 50mV following a 10-100% or 100-10% load change of 5 $\mu\text{S}$  risetime. Typical instantaneous output deviation 350mV

**Operating ambient temperature range** 0  $^{\circ}\text{C}$  to 55  $^{\circ}\text{C}$  for full output current

**Maximum operating ambient temperature** 70  $^{\circ}\text{C}$ . Output current derates linearly from full load at 55  $^{\circ}\text{C}$  to half load at 70  $^{\circ}\text{C}$

**Storage temperature range**  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

**Hold-up time** Output maintained for typically 5mS at maximum output current and 50V nominal input with the unit operating at maximum output voltage

**Switch-on surge** Limited by soft start facility to 3 times full load current

**Switch-on time** Output established within 600mS typically

**Insulation** Tested at 500V peak for one minute between d.c. input and d.c. output, with output terminals and earth connected together.  $\pm 250\text{V}$  d.c. continuous rating between output and earth. Tested to 500V d.c. for one minute

**Remote voltage control** Programming resistance 1000 $\Omega/\text{V} \pm 0.5\%$   
Range: 1V to unit max. output voltage

**External sensing limitation** Unit output terminal voltage must not exceed 6V for nominal 6V units, 12.6V for nominal 12V units and 25.2V for nominal 24V units, i.e. load voltage + total lead voltage < max. range voltage

**Efficiency** Better than 70%. Typically 77% at full load

**Protection Overload** Constant current limiting set at 110%  $\pm 5\%$  of full load.

Option C. As above plus output disabled after approx. 200mS of overload

**Overvoltage** Set at nominal output voltage  $+20\%$ . Disables control circuit and output falls to zero. See options.

**Fuse** The d.c. input circuit is fused

**Series and parallel operation** No limit on parallel operation  
Series operation to a max. total output voltage of 250V

**Remote on/off** Output is reduced to zero by short-circuiting the 'PROG' and '+S' terminals

**Options** Suffix C overcurrent trip. For overvoltage at 6V instead of  $+20\%$  add on suffix D (on 6V units)

# OPERATING INSTRUCTIONS

## Installation

The units are designed to operate from a nominal d.c. supply as listed in the specification, in ambient temperatures between 0°C and 55°C.

Because cooling is by air convection, provision should be made to allow free air flow around and through the unit. Ventilation holes should be provided in the mounting plate or alternatively the unit should be vertically spaced off an un-ventilated plate by at least 15mm.

## D.C. input

The d.c. input terminals are located on the 3-way terminal block at the left hand side of the front panel, and marked + (positive), - (negative) and (earth).

## Output connections

Output is taken from the large studs on the front panel marked 'OUTPUT' '+' and '-'. Presence of output voltage is indicated by the L.E.D. located near the output terminals (see note 2 in resistive programming section).

## Remote sensing

The remote sensing terminals are situated on the 6-way terminal block on the front panel. As supplied, the sense terminals marked '+S' and '-S' are connected to the terminals marked '+' and '-' by metal links. (The '+' and '-' terminals are connected internally to the main output studs but on no account should load current be drawn from them). For remote sensing applications, both metal links are removed and the +S and -S terminals are connected to the remote load, observing correct polarity. The voltage drop in each output lead should not exceed 5V and the load voltage plus total lead drop should not exceed 6V for 6V nominal units and nominal +5% for other units.

## Resistive programming

Output voltage may be programmed by removing the metal link between the 'INT' and 'PROG' terminals and connecting the external programming resistor between the 'PROG' and '+S' terminals. The programming constant is  $1\text{k}\Omega/\text{V} \pm 5\%$  and the unit can be programmed from 1V to the unit maximum voltage.

- Notes:-
- 1) Do not remove the link between the '+S' and '+' terminals unless remote sensing operating is required in addition to resistive programming
  - 2) The output L.E.D. indicator varies in brightness with change in output voltage and will not be operational for output voltages below approximately 3V.

## Remote on/off

The output may be reduced to zero by short-circuiting the 'PROG' and '+S' terminals.

### Mounting and ventilation

The units are provided with M3 threaded fixing holes in the base on both sides. N.B. FIXING SCREWS MUST NOT PROJECT INTERNALLY MORE THAN 6mm WHEN MEASURED FROM OUTER FACE OF POWER SUPPLY. 8mm LONG FIXING SCREWS ARE SUPPLIED.

Cooling is by natural convection and provision should be made to allow free air flow into the bottom and out of the top of the unit, particularly in the area of the main heat sink. If the unit is to be mounted on a flat plate, ventilation holes, corresponding to the unit mesh cover holes and the heatsink plan area, should be punched in the plate, or the unit raised off the plate by at least 10mm.

Units may be operated, if necessary, in an inverted position without derating.

### Series and parallel operation

Units with the same nominal output voltage may be connected in parallel without limitation.

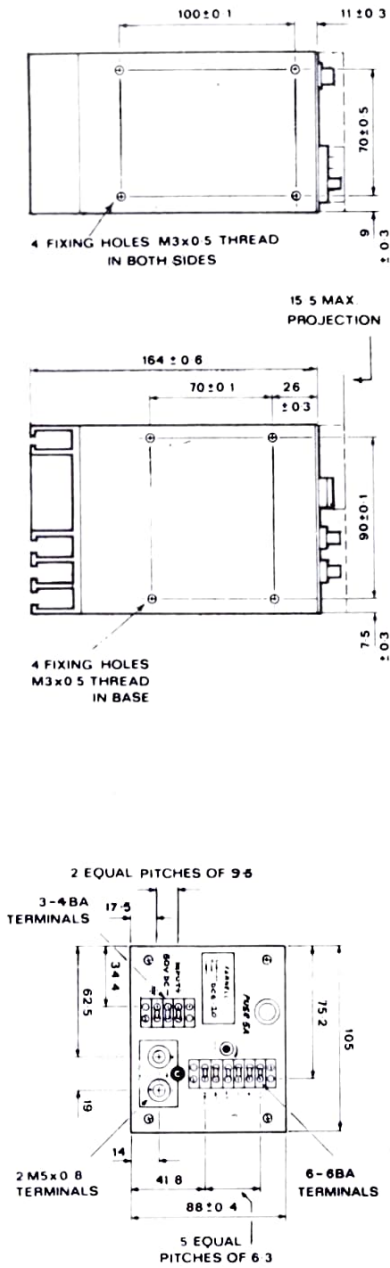
Units with the same output current rating may be connected in series up to a maximum total output of 250V.





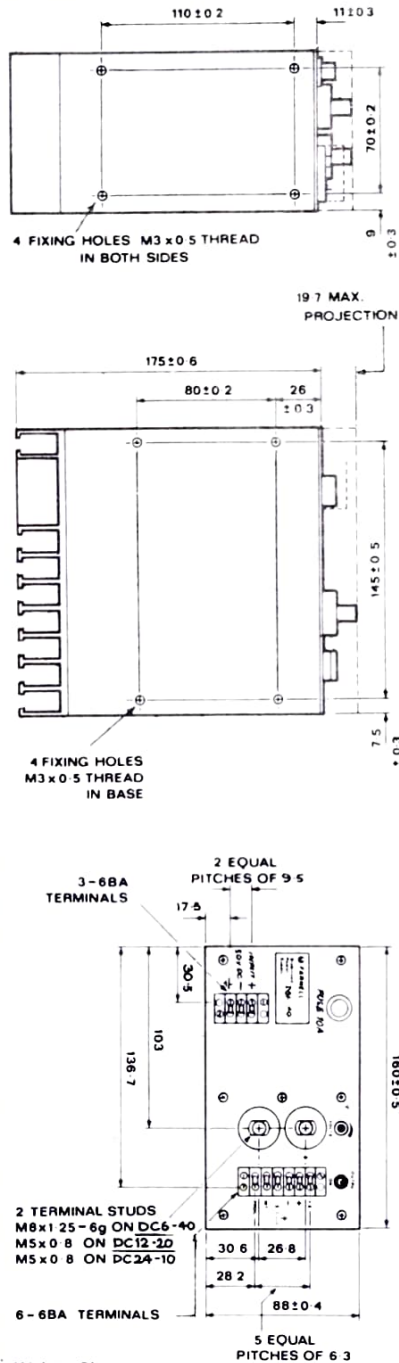
# MECHANICAL DETAILS

**Mechanical details : 120 watt package**



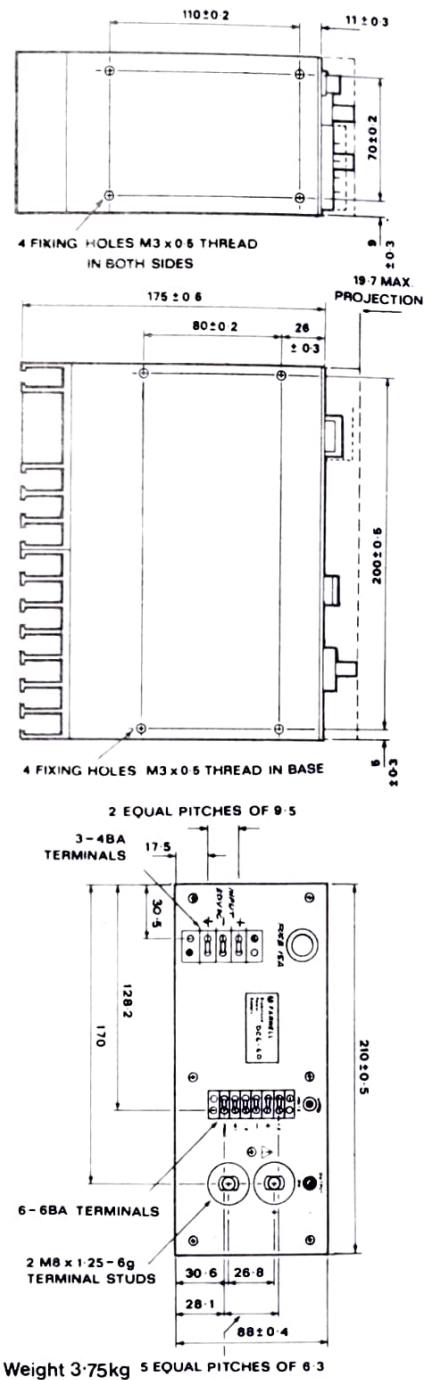
Weight 2kg

**240 watt package**



Weight 3kg

**360 watt package**



Weight 3.75kg

## MAINTENANCE

The equipment supplied by Farnell Instruments Ltd. is guaranteed against defective material and faulty manufacture for a period of twelve months from the date of despatch. In case of material or components employed in the equipment but not manufactured by us, we allow the customer the period of any guarantee extended to us.

The equipment has been carefully inspected and submitted to comprehensive tests at the factory prior to despatch. If, within the guarantee period, any defect is discovered in the equipment in respect of material or workmanship and reasonably within our control, we undertake to make good the defect at our own expense subject to our standard conditions of sale. In exceptional circumstances and at the discretion of the Service Manager, a charge for labour and carriage costs incurred may be made.

Our responsibility is in all cases limited to the cost of making good the defect in the equipment itself. The guarantee does not extend to third parties, nor does it apply to defects caused by abnormal conditions of working, accident, misuse, neglect or wear and tear.

### Maintenance

In the event of difficulty, or apparent circuit malfunction, it is advisable to telephone (or telex) the Service Department or your local Sales Engineer or Agent (if overseas) for advice before attempting repairs.

For repairs, it is recommended that the complete unit be returned to:-

The Service Department  
Farnell Instruments Ltd.  
Sandbeck Way  
Wetherby, West Yorkshire.  
LS22 4DH

or

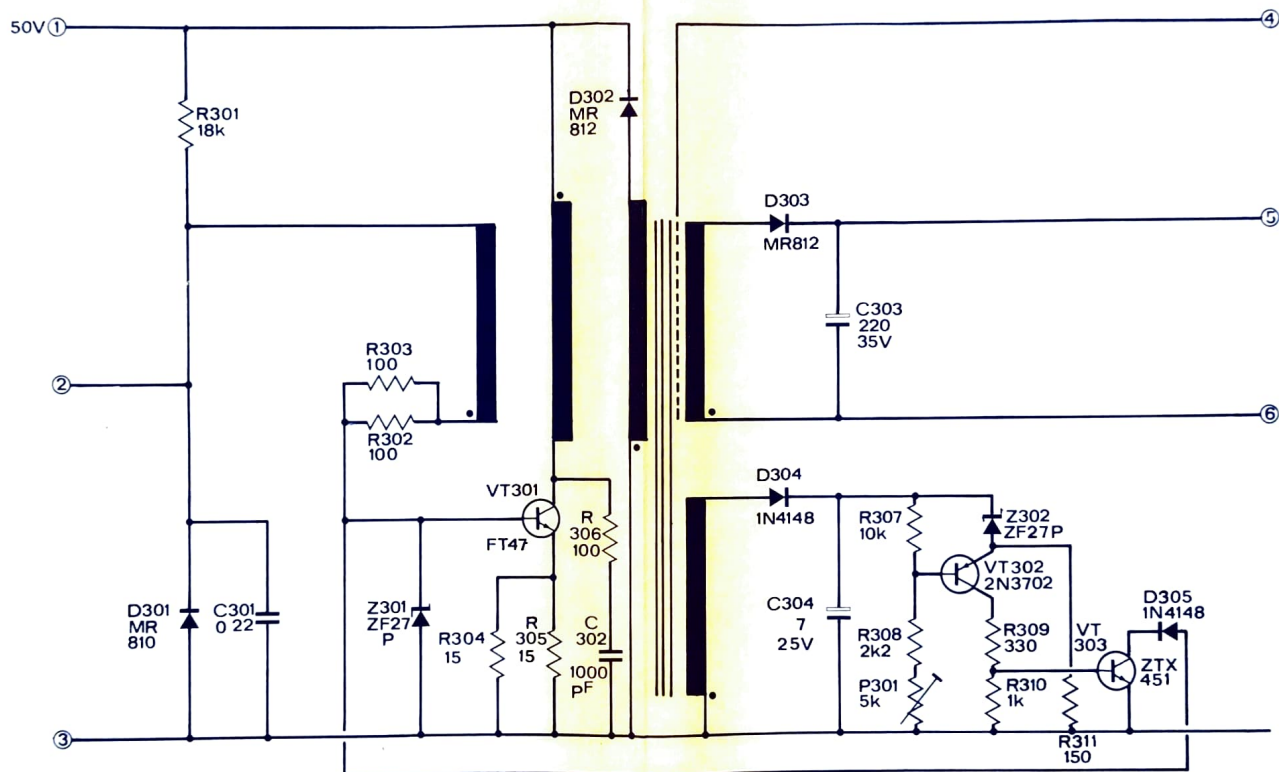
Service Depot  
Farnell Instruments Ltd.  
2 Orley Court  
Greenford Road  
Harrow HA1 3QD, Middlesex.

Tel: 0937 63541 Telex: 557294

Tel: 01-864 7433/7434

Please ensure adequate care is taken with packing and arrange insurance cover against transit damage or loss.

R	301	302-3	304	305	306	307-8	309 310	311	
C	301				302	303-4			
VT				301			302	303	
D	301				302	303 4		305	
MISC		Z301				P301 1	Z302		



TRACED P.6.F	ISS	DATE	MOD No.	ISS	DATE	MOD No.
CHECKED S.P.B.						
DRAWN K.L.P.	A	30-677				

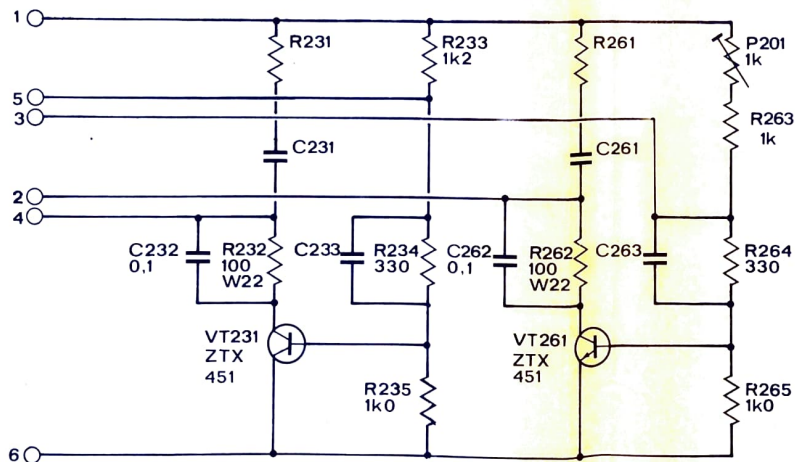
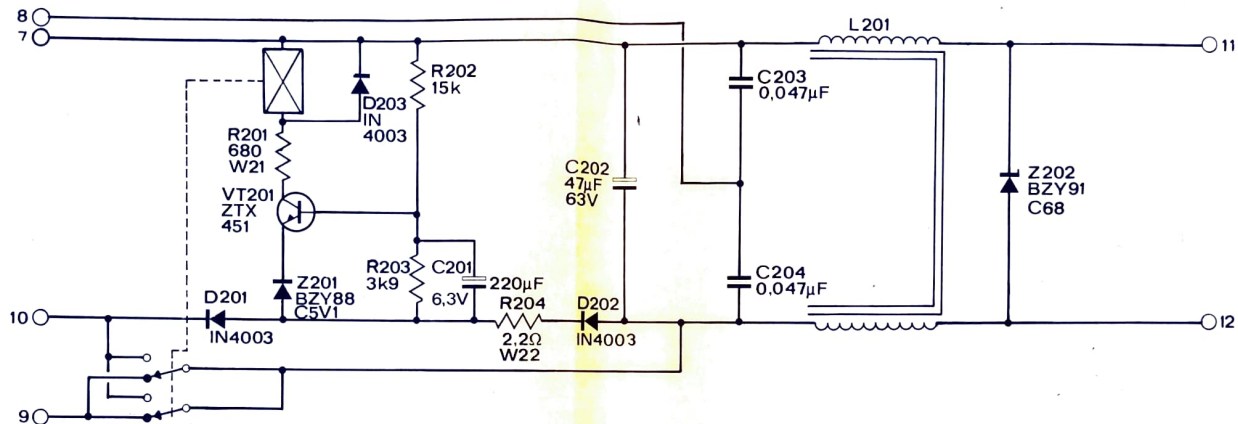
USED ON F881  
882  
883  
887



NOTE:  
CAPACITOR VALUES GIVEN IN  $\mu$ F.  
RESISTOR VALUES IN  $\Omega$   
UNLESS OTHERWISE STATED.

FARNELL INSTRUMENTS LTD. WETHERBY, YORKS.	
TITLE AUX. SUPPLY CCT. DIA DC 120W UNITS	DRAWING No. 3SZX0084
SHEET	OF SHEETS

3SZX0082

884



Traced										
Checked		B	9-10-78	Q5007.						
Drawn		iss	date	mod no						
		A	23 6-77	→						

all resistor values given in ohms  
.. capacitor .. .. microfarads

**FARNELL** INSTRUMENTS LTD., WETHERBY.

title	INPUT	FILTER	BD.
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DC;  
240 / 360W units

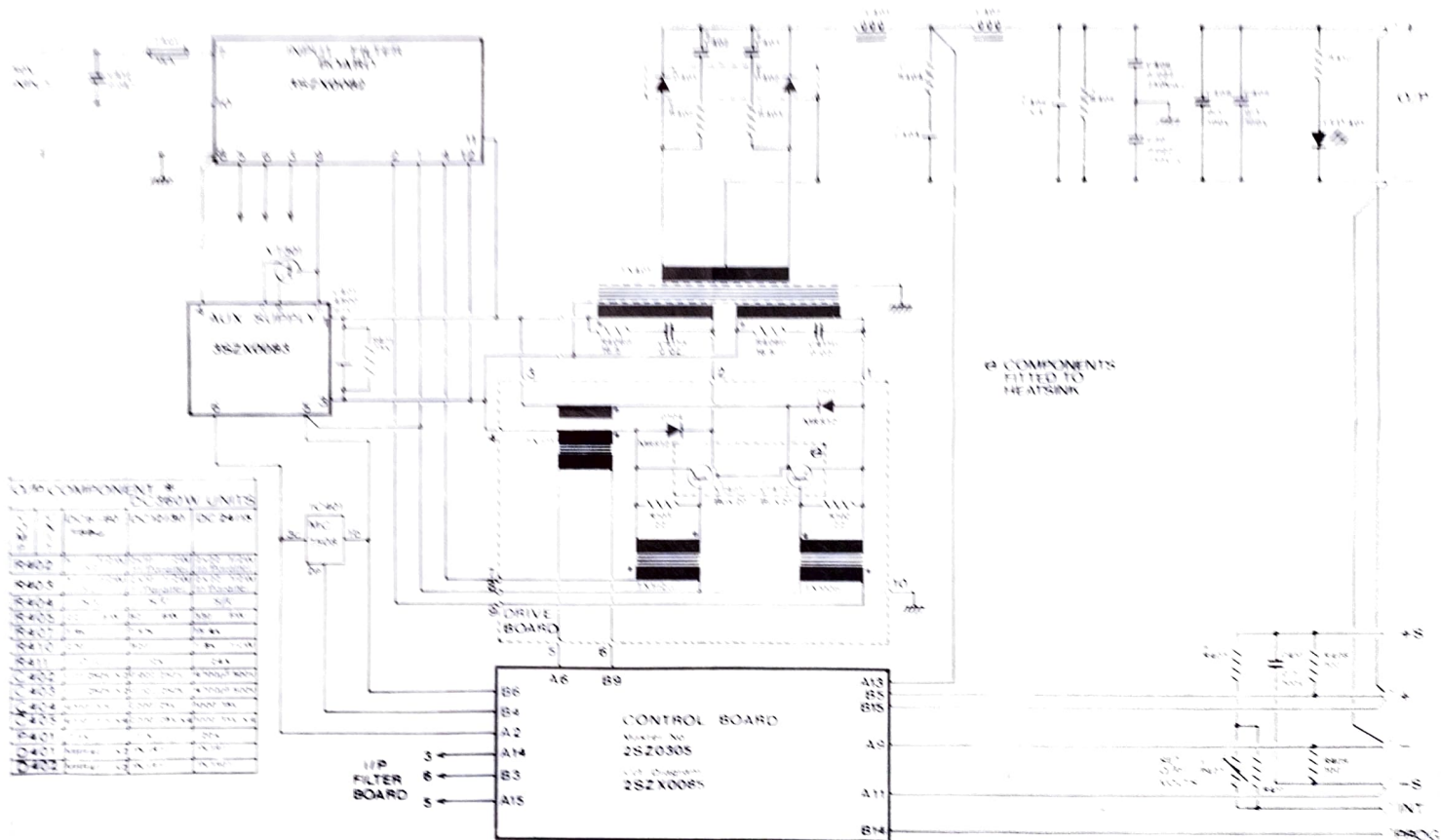
drq. no.

3SZX0082



0 / 360W units

401 402 403 404 405 406 407 408 409 410 R  
C  
V  
MISC



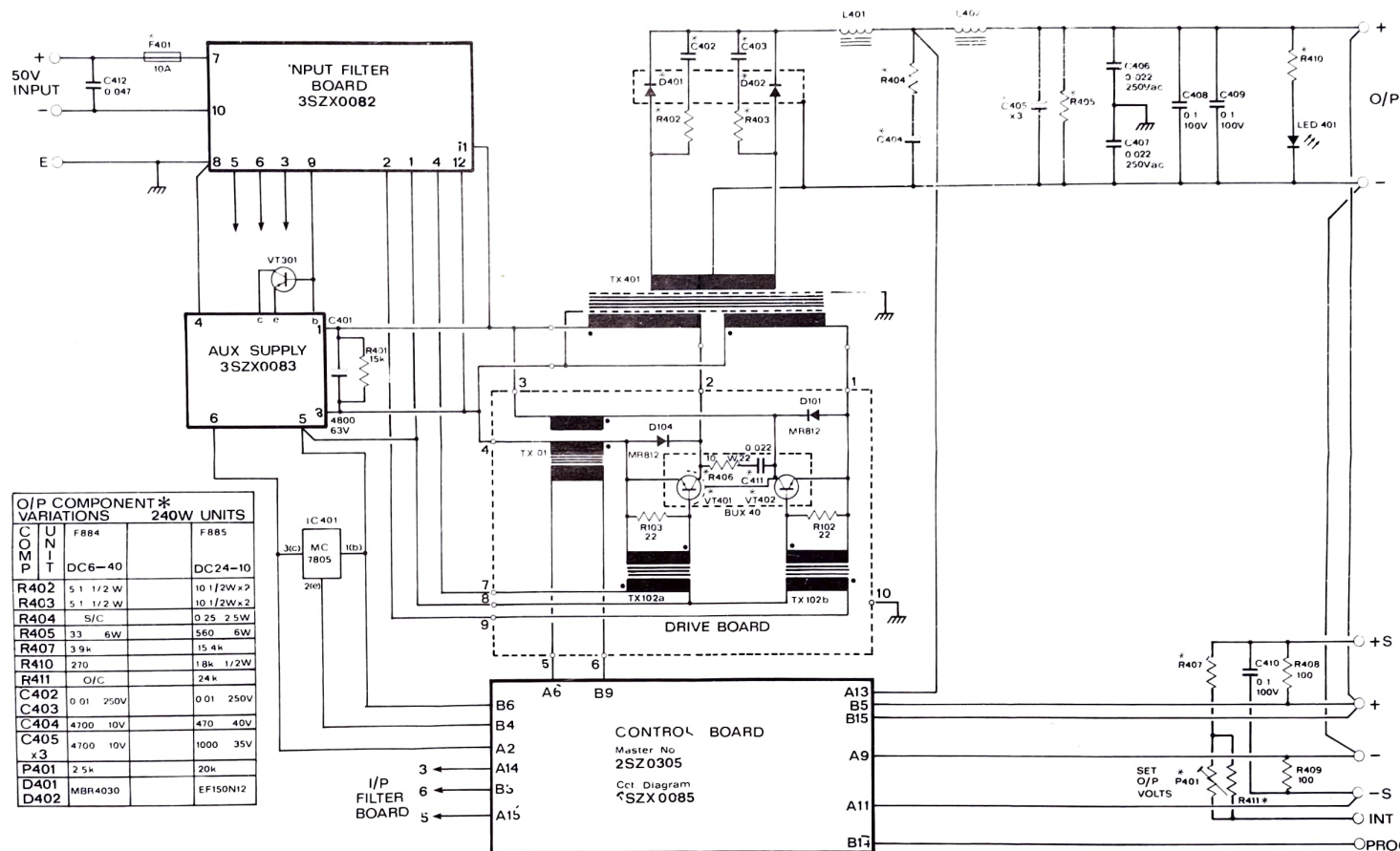
FARNELL INSTRUMENTS LTD. WETTERBY, YORKS.

THE CONNECTION DIAGRAM

DC360W UNITS

252V0005

R			401		103.402	406	403	102		404		405		407.411	408.409.410	R
C		412		101			402	403.411		404		405	406	407	408.409.410	C
VT			301				401	402								VT
D							401.104	402	101							D
MISC		F401		IC401		TX101	TX401	TX102		L401		L402		P401	LED401	MISC



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76.F								
CHECKED								
DRAWN								
LDG.								

ISS 884  
885

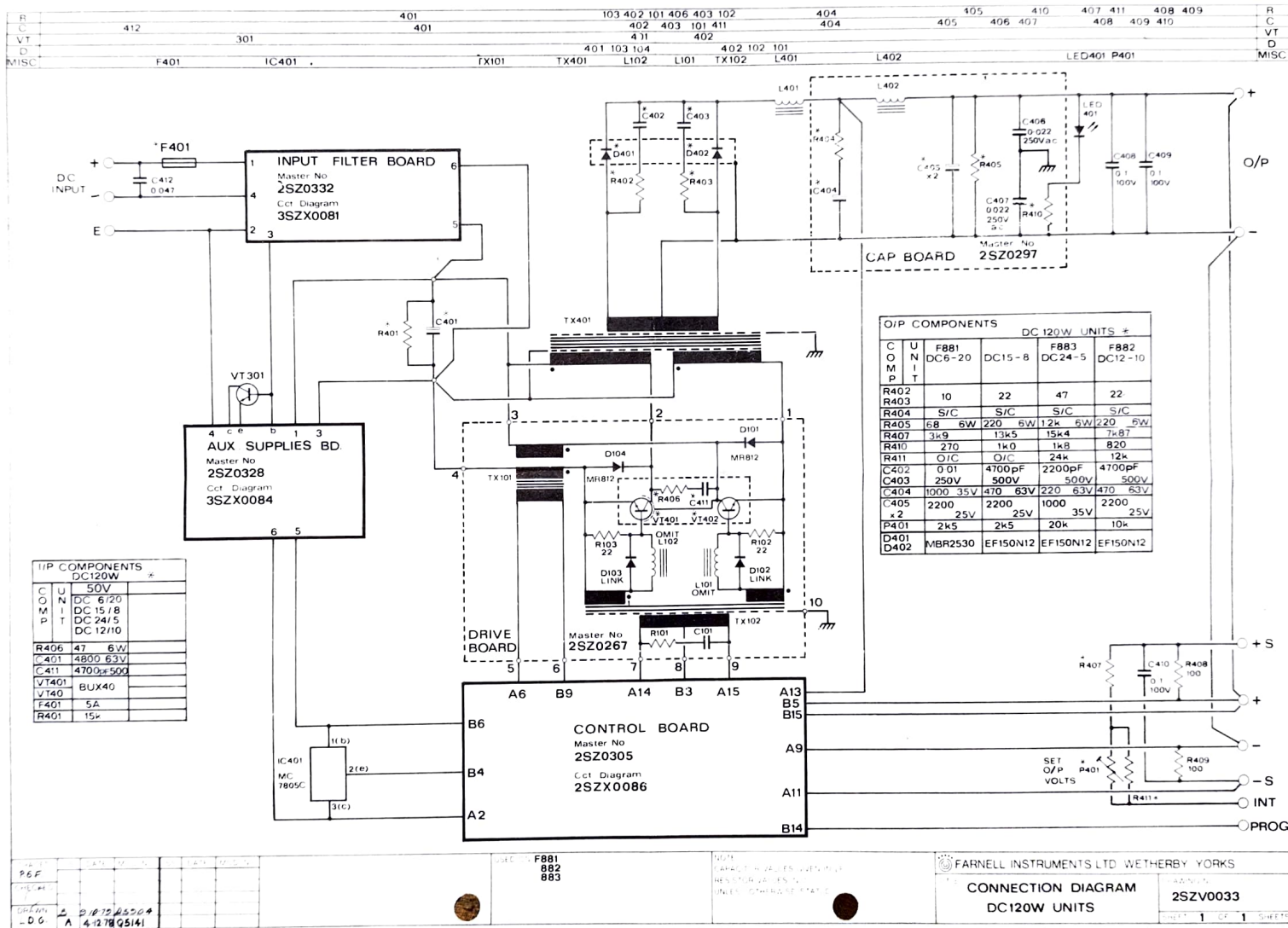
NOTE  
CAPACITOR VALUES GIVEN IN P.P.  
RESISTOR VALUES IN P.P.  
UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD WETHERBY, YORKS

CONNECTION DIAGRAM  
DC240W UNITS

DRAWING No:  
2SV0034

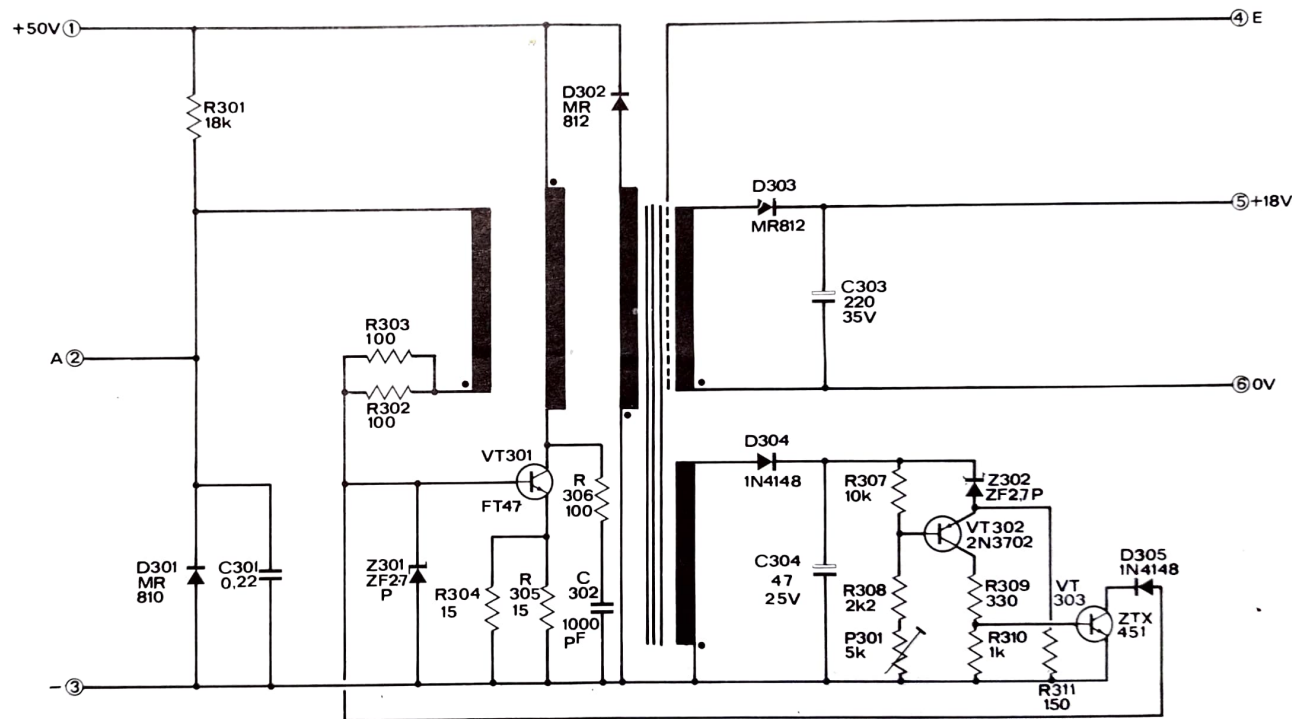
SHEET 1 OF 1 SHEETS







R	301	302-3	304	305	306	307-8	309	310	311	R
C	301				302	303-4				C
VT				301			302	303		VT
D	301				302	303-4			305	D
MISC		Z301				P301	Z302			MISC



TRACED	ISS	DATE	MOD No	ISS	DATE	MOD No
P.6f						
CHECKED						
DRAWN						
K.L.P.	A	20/12/78				

USED ON	F881
	882
	883
	887
	2521
	26

NOTE  
CAPACITOR VALUES GIVEN IN  $\mu$ F  
RESISTOR VALUES IN  $\Omega$   
UNLESS OTHERWISE STATED

FARNELL INSTRUMENTS LTD. WETHERBY, YORKS.	TITLE	DRAWING No
	AUX. SUPPLY CCT. DIA	3SZX0084
	DC120W UNITS	
	SHEET	OF SHEETS